STATINTL

October 26, 1964

STATINTL

Attention:

Gentlemen:

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As a result of recent developments at the we are able to offer our customers two new optical systems for use on Type 621 Comparators, one with the capability of resolving 200 line pairs per millimeter at the film plane, the other of resolving 400 line pairs per millimeter at the film plane. Each of these systems is a zoom (2:1 ratio) binocular microscope with a magnification range of 20X to 40X when using 5X eyepieces, 40X to 80X when using 10X eyepieces on the 400 line system, 17.5X to 35X when using 5X eyepieces, and 35X to 70X when using 10X eyepieces on the 200 linesystem. A variable high intensity tungsten light source, which requires a traveling sub-stage condenser lens and mirror assembly mechanically servoed to the motion of the optical system is also supplied with this microscope.

It would be required that your Type 621 Comparator between up by our field engineer and returned to our plant in to perform this work because machining and subsequent rescraping of the base, bridge, and bridge brackets is necessary for adaptation of the system.

Since the comparator will be at our plant and torn down for the above modifications, we propose to repair the damage done to the comparator as a result of extremely high humidity it had been accidentally subjected to. The refurbishing work to bring the comparator to a like-new condition would consist of the following:

- 1. Recut and relap the Y Axis lead screw and replace the Y Axis precision nut.
- 2. Relap the X Axis lead screw and if necessary replace the X Axis precision nut.
- 3. Replace all the precision ball bearings in the system.

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- 4. Rewire the entire electrical system, replacing all electrical components, switches, etc.
- 5. Rescrape entire instrument.
- 6. Refinish all parts where possible.
- 7. Modify the comparator table for the new illumination and replace the chair.
- 8. Repaint the entire instrument.

Upon completion of the above work, the comparator would be reassembled, recalibrated, delivered and installed at your facility in Washington, field engineer. D.C. by a

The cost of the above work with either of the two optical systems is as follows:

> 400 line system 1.

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2. 200 line system

Our terms are net 30 days. This quotation shall be firm for a period of 45 days.

STATINTL would proceed to manu-Upon receipt of contract, facture the required parts for the modification and would pick up the equipment at a point which would keep the total down time to a minimum. It is estimated that we would return the equipment to our plant in 30 to 45 days and complete the modification and refurbishing in an additional 30 to 45 days. STATINTL

Very truly yours,

Manager, Engineering Dept.

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Design Objectives for New Viewing Optics
for a 8009 Comparator

Comparator

Comparator

- be met in designing high resolution viewing optics for & Model 8009 STATINTL parator. This microscope is intended to increase the maximum utilization of this instrument when measuring high resolution materials. The new system must provide higher resolution, greater magnification and binocular viewing along with an improved reference mark or reticle. The present illumination system must be replaced or modified to complement the new optics. The Model 8009 Comparation and binocular viewing along with an improved reference mark or reticle. The present illumination system must be replaced or modified to complement the new optics. The Model 8009 Comparation are stained at the Naval Photographic Interpretation Center and will be available for familiarization to the contractor receiving the award.
- 2. General Description. The new optics shall consist of a binocular microscope containing a zoom pod capable of providing continuously variable magnifications between 10X and 50X. This microscope shall provide ultra-high resolution viewing and shall be mountable upon the existing mounting points utilized by the present system. All of the necessary optical controls must be mounted upon the microscope unit within easy reach of the operator. A higher intensity continuously variable illumination source shall be designed to replace the present fixed intensity system.

## 3. Detailed Requirements.

### a. Optical

- (1) Magnification. The magnification shall be of the continuously variable or Zoom type with a range of from 10X 50X.
- (2) Resolution. Resolution shall be of the highest possible quality obtainable within the present "state-of-the-art". A resolution of 8 times the magnification, expressed in lines/mm is a desired goal.
- (3) Image quality. The image quality shall be of the very highest. The image field shall be flat and free of color and other distortions.
- (4) Eyepiece focus. Provision shall be made for independent eyepiece focus adjustments to accommodate variations in the visual acuity between the right

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- (5) Interpupillary distance. Provision shall be made for adjustment of the binocular eyepieces to accommodate variations in interpupilary distance between different operators. A locking device shall be provided so that once the operator determines the most comfortable setting for his requirements, it can not be inadvertantly changed.
- (6) Fine focus. A means shall be provided for adjusting the objective lens to bring the subject image into critical focus. This fine focus shall be maintained throughout all magnification setting changes.
- (7) Reference mark. A fine reticle, minute dot, point of light or alternate advanced reference system shall be provided within the microscope viewing system. This reference system shall be appropriate to the magnifications and measurement accuracies involved. The system must insure adequate optical repeatability commensurate with the + 1 micron measurement accuracy of the comparator lead screw system. An individual focus adjustment shall be provided for bringing this reference mark into sharp focus. The inclusion of an indicator or graduations which will indicate when the reference mark is at optimum focus is a design goal.

- (8) Size of angular field. The angular dimension of both the apparent and the actual optical fields of this system shall meet standards characteristic of good microscope design.
- (9) Size of the exit pupil. The size of the exit pupil and the distance of the eye from the eyepiece shall meet standards characteristic of good microscope design.
- Illumination -- A high intensity illumination system shall be provided. This system shall furnish even illumination over the enture field of view throughout the entire magnification range. The light shall be essentially white and of such an intensity that both the image and the reference mark shall be distinctly visible at all magnifications. This illumination shall be continuously variable from 25% - 100% of the full intensity. In addition, a means shall be provided for back-lighting the stage plate to facilitate orientation of work materials. A special problem exists, in that the microscope may translate a maximum of 18" during "x" measurements. The present system solves this problem with a long fluorescent tube and from surface mirror to provide light throughout the range of travel. This tube also provides stage plate back-lighting. It is doubtful that a variation of this system will provide adequate illumination for 50X magnifications. It is mandatory that any proposed illumination system be kept as simple as possible within the bounds of the previously stated requirements.
- c. The two comparators to be modified under the pend of contract are Serial Numbers 621006 and 88001 presently located at the Naval Photographic Interpretation Center.

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## POR A 6005 COMPARATOR

### L. CREENTIGUAL CUICUPIS.

These design objectives describe the requirements to be not in designing high resolution viewing cytics for a Model 8009 Com- STATINTL parator. This microscope is intended to increase the meximum utilization of this instrument when necessaring high resolution materials. The new system wast provide higher resolution, greater magnification and binocular viewing along with an improved reference mark or reticle. The present illumination system must be replaced or modified to complement the new optics.

### 2. GENERAL DESCRIPTION.

The new optics shall consist of a binocular microscope containing a zoom pod capeble of providing continuously variable magnifications between 10% and 50%. This microscope shall provide ultra-high resolution viewing and shall be mountable upon the microscope shall provide ultra-high resolution viewing and shall be mountable upon the microscope shall of the necksaary optical controls must be mounted upon the microscope sait within easy reach of the operator. A higher intensity continuously variable illumination source shall be designed to replace the present fixed intensity system.

#### 3. DYTALLED REQUIREMENTS.

#### e. Ortical

- (1) Magaification. The magaification shell be of the continuously variable or Zoom type with a range of from 10A 30A.
- (2) Resolution. Resolution shall be of the highest possible quality obtainable within the present "state-of-the-art". A resolution of 8 times the magnification, expressed in lines/ma is a desired goal.
- (3) large quality. The image quality shall be of the very highest. The image field shall be flat and free of color and other distortions.
- (4) Symplece focus. Provision shall be made for independent eyopieco focus edjustments to secommodate voriations in the visual sculty between the right and the left eyes.
- (5) Interpupillary distance. Provision shall be made for adjustment of the bimodular eyapioces to endemodate variations in interpupilary distance between different operators. A present class locking

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device shall be provided so that once the operator determines the most confortable setting for his requirements, it can not be inadvertently

- (6) Fine focus. A mame aball be provided for adjusting the objective less to bring the subject image into critical focus. This fine focus shall be maintained throughout all magnification secting changes.
- (7) Enference work. A first roticle, winute dot, point of light of alternate covered reference system shall be provided within the microscope viewing system. This reference system shall be appropriate to the negalifications and measurement accuracion involved. The system micros measurement optical respectability communicate with the 1 limitorism measurement accuracy of the competator hand acress system. An individual focus adjustment shall be provided for bringing this reference which will indicate when the reference mark into sharp focus. The inclusion of an indicator or graduations which will indicate when the reference mark is at optimum focus is a design goal.
- (6) file of empular field. The appolar discussion of both the appearant and the actual optical ideas of this system shall meet standards characteristic of good microscope design.
- (9) Size of the exit pupil. The size of the exit popil and the distance of the eye from the symptone shall must standards characteristic of good microscope design.
- b. Illumination. A high interestry illumination eyeten shall be provided. This system shall furnish even illumination over the entire shall be especially white and of much an intensity that both the image and the reference much shall be distinctly visible at all magnifications. This illumination shall be obtineducly variable from 15% 100% of the full intensity. In addition, a masse shall be provided for back-lighting the stage plate to inclitate orientation of work materials. A special problem exists, in that the microscope may translate a maximum of 16° dering "a" measurements. The present system solves this problem with a long fluorescent take and from a maximum of 16° and the reason of travel. This take the provides stage plate back-lighting. It is doubtful that a variation of what system will provide adequate illumination for 50% magnifications. In is manualized that any proposed illumination system he kept an simple of possible within the bounds of the previously stated requirements.

# Design Objectives for New Viewing Optics for a 8009 Comparator

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- be met in designing high resolution viewing optics for a Model 8009

  parator. This microscope is intended to increase the maximum utilization of this instrument when measuring high resolution materials. The new system must provide higher resolution, greater magnification and binocular viewing along with an improved reference mark or reticle. The present illumination system must be replaced or modified to complement the new optics. The Model 8009

  STATINTL Comparator of the retained at the Naval Photographic Interpretation Center and will be available for familiarization to the contractor receiving the award.
- 2. General Description. The new optics shall consist of a binocular microscope containing a zoom pod capable of providing continuously variable magnifications between 10X and 50X. This microscope shall provide ultra-high resolution viewing and shall be mountable upon the existing mounting points utilized by the present system. All of the necessary optical controls must be mounted upon the microscope unit within easy reach of the operator. A higher intensity continuously variable illumination source shall be designed to replace the present fixed intensity system.

## 3. <u>Detailed Requirements</u>.-

### a. Optical

- (1) Magnification. The magnification shall be of the continuously variable or Zoom type with a range of from 10X 50X.
- (2) Resolution. Resolution shall be of the highest possible quality obtainable within the present "state-of-the-art". A resolution of 8 times the magnification, expressed in lines/mm is a desired goal.
- (3) Image quality. The image quality shall be of the very highest. The image field shall be flat and free of color and other distortions.
- (4) Eyepiece focus. Provision shall be made for independent eyepiece focus adjustments to accommodate variations in the visual acuity between the right and the left eyes.

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- (5) Interpupiliary distance. Provision shall be made for adjustment of the binocular eyepieces to accommodate variations in interpupilary distance between different operators. A locking device shall be provided so that once the operator determines the most comfortable setting for his requirements, it can not be inadvertantly changed.
- (6) Fine focus. A means shall be provided for adjusting the objective lens to bring the subject image into critical focus. This fine focus shall be maintained throughout all magnification setting changes.
- (7) Reference mark. A fine reticle, minute dot, point of light or alternate advanced reference system shall be provided within the microscope viewing system. This reference system shall be appropriate to the magnifications and measurement accuracies involved. The system must insure adequate optical repeatability commensurate with the + 1 micron measurement accuracy of the comparator lead screw system. An individual focus adjustment shall be provided for bringing this reference mark into sharp focus. The inclusion of an indicator or graduations which will indicate when the reference mark is at optimum focus is a design goal.
- (8) Size of angular field. The angular dimension of both the apparent and the actual optical fields of this system shall meet standards characteristic of good microscope design.
- (9) Size of the exit pupil. The size of the exit pupil and the distance of the eye\_from the eyepiece shall meet standards characteristic of good microscope design.
- b. Illumination.— A high intensity illumination system shall be provided. This system shall furnish even illumination over the entere field of view throughout the entire magnification range. The light shall be essentially white and of such an intensity that both the image and the reference mark shall be distinctly visible at all magnifications. This illumination shall be continuously variable from 25% 100% of the full intensity. In addition, a means small be provided for back-lighting the stage plate to facilitate orientation of work maternals. A special problem exists, in that the microscope may translate a maximum of 18% during "x" measurements. The present system solves this problem with a long fluorescent tube and from surface mirror to provide light throughout the range of travel. This tube also provides stage plate back-lighting. It is doubtful that a variation of this system will provide adequate illumination for 50% magnifications. It is mandatory that any proposed illumination system be kept as simple as possible within the bounds of the previously stated requirements.
- c. The two comparators to be modified under the pend of contract are Serial Numbers 621006 and 88001 presently located at the Naval Photographic Interpretation Center.

Approved For Release 2001/05/11 : CIA-RD₱₹8B04747A000900080003-2

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## DRUIGH OBJECTIVES FOR NEW VIRWING OFFICS FOR A 4009 COMPARATOR

### I. GREATICHAL CHEEPES.

These design objectives describe the requirements to be met in designing high resolution viewing optics for a Modal 8009 Com- STATINTL parator. This microscope is intended to increase the maximum utilization of this instrument when measuring high resolution meterials. The new system must provide higher resolution, greater magnification and binocular viewing along with an improved reference mark or raticle. The present illumination system must be replaced or modified to complement the new eptics.

### 2. CHERAL DESCRIPTION.

The new optime shall consist of a binocular microscope containing a noon pod capable of providing continuously variable magnifications between 10% and 10%. This microscope shall provide ultra-high resolution viewing and shall be mountable upon the existing mounting points utilized by the present system. All of the necessary optical controls must be mounted upon the wicroscope unit sithin easy reach of the operator. A higher intensity continuously variable illumination source shall be designed to replace the present rimed intensity system.

### 3. DETAILED BEQUIREMENTS.

### a. Optical

- (1) Magnification. The magnification shall be of the continuously variable or Moon type with a range of from 10s 20%.
- (2) mesolution. Resolution shall be of the highest possible quality obtainable within the present "state-of-the-art". A resolution of 8 times the magnification, empressed in lines/mm is a desired goal.
- (3) image quality. The image quality shall be of the very highest. The image field shall be flat and free of color and other distortions.
- (4) Symplece forms. Provision shall be med: for independent eyopiese forms of justments to seconddate variations in the visual sculty between the right and the left eyes.
- (5) Interpopillary distance. Provision shall be made for adjustment of the binocular eyepieces to accommodate variations in interpopilary distance between different operators. A pressure class locking

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device shall be provided so that once the operator determines the most confortable setting for his requirements, it can not be inadvertably changed.

- (6) Fine focus. A means shall be provided for adjusting the objective less to bring the subject image into critical focus. This fine focus shall be maintained throughout all magnification setting changes.
- (7) Reference mark. A fine reticle, minute dot, point of light or elternete advanced reference system shall be provided within the microscope viewing system. This reference system shall be appropriate to the magnifications and measurement accuracies involved. The system must insure adequate optical repeatability commensurate with the ± 1 micros measurement eccuracy of the comperator load scree system. An individual focus adjustment shall be provided for bringing this reference mark into sharp focus. The inclusion of an indicator or graduations which will indicate them the reference mark is at optimum focus is a casign goal.
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